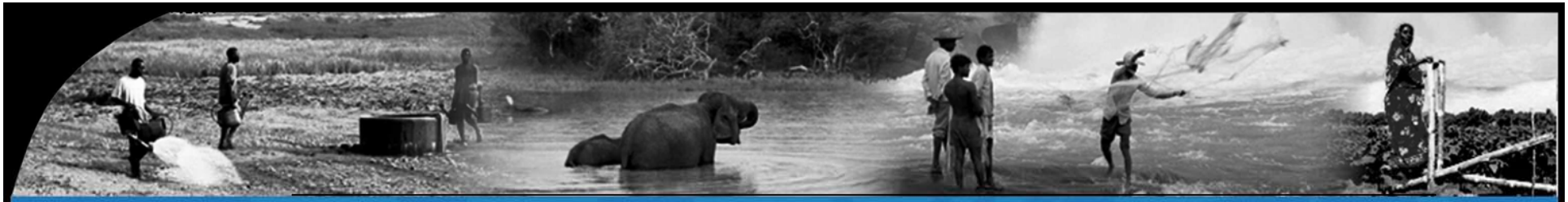

Sustainable Sloping Land & Watershed Management 2006
Luang Prabang, 12-15 December 2006

Hillslope sediment trapping of natural or cultivated riparian vegetation of Northern Laos

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International Water Management Institute

IRD Institut de recherche pour le développement

NAFRI National Agriculture and Forestry Research Center

www.iwmi.org

Changes of land use in sloping land

- In Northern Laos, recent intensification of the land use led to increased sediment delivery to water bodies

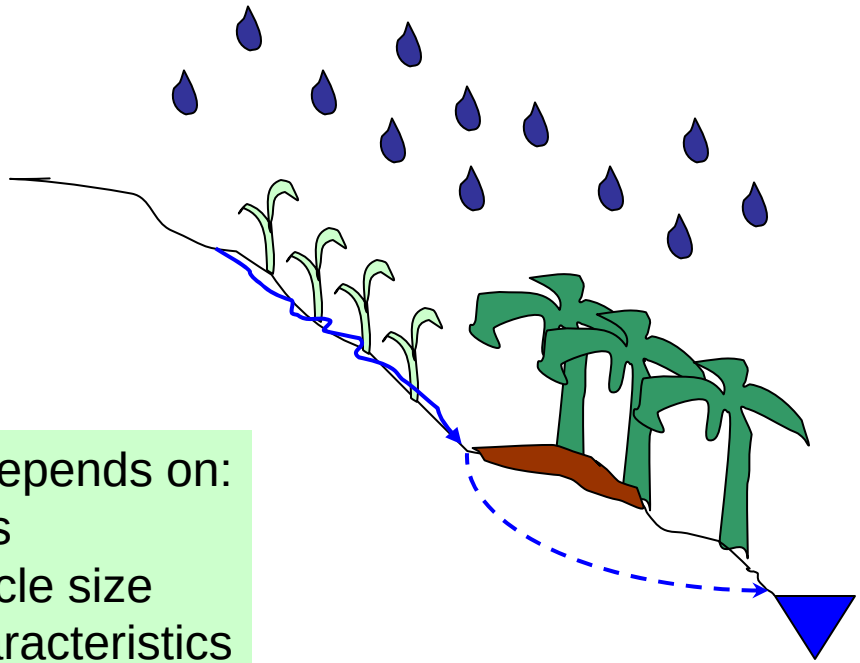
Changes of land use in riparian land

Research questions

- what are the impacts of these changes on ecological functions of riparian land?

- what management of riparian areas can counteract the off-site impacts of increased erosion on the hillslopes?

Sediment retention in riparian land



effectiveness depends on:
-inflow amounts
-sediment particle size
-vegetation characteristics
-topographic setting

Aims of this study

- to assess water and sediment trapping efficiencies of riparian vegetation types of Northern Laos

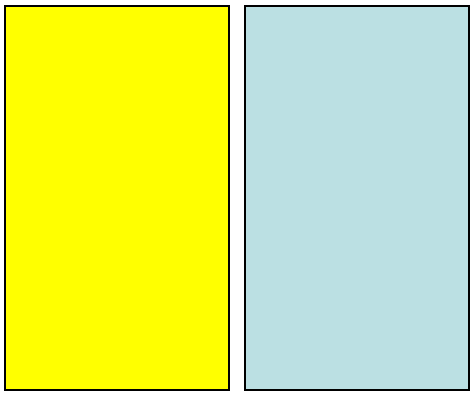
- to assess the potential effect of cultivation of riparian land on these efficiencies

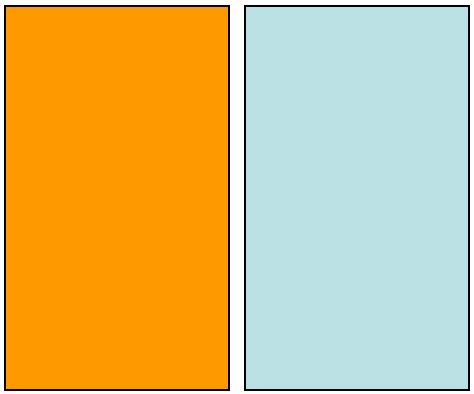
Study area: Houay Pano catchment

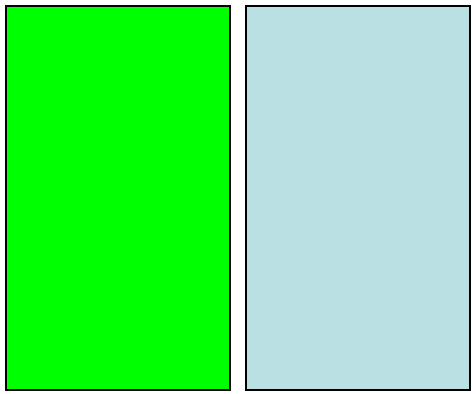
Monitoring of event runoff and sediment

- By using Gerlach troughs, i.e. 50-cm open troughs that intercept water runoff

Experiment set-up: 3 sites in 2 plots







Banana

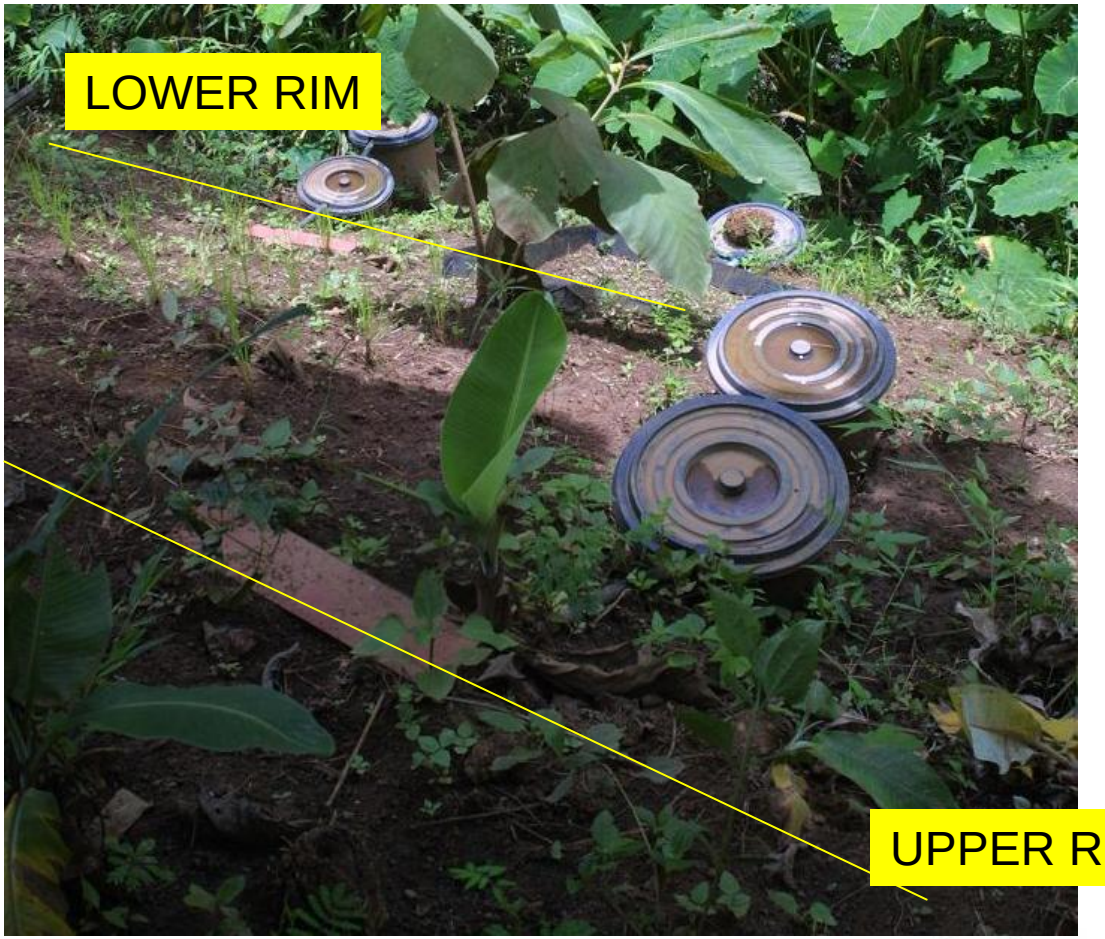
Bamboo

Natural grass

ni.org

Experiment set-up (II): plot setting

- 3 Gerlachs in upper rim to intercept incoming runoff and
- 3 Gerlachs in lower rim to intercept outgoing runoff



Trapping efficiency

$$TE = \frac{X_{UP} - X_{DOWN}}{X_{UP}}$$

- X = water or sediment amount
- UP = average of three upper rim troughs (incoming flow)
- DOWN = average of three lower rim troughs (outgoing flow)
- Defined for water runoff, sediment load, and sediment concentration

Results of 2006 season

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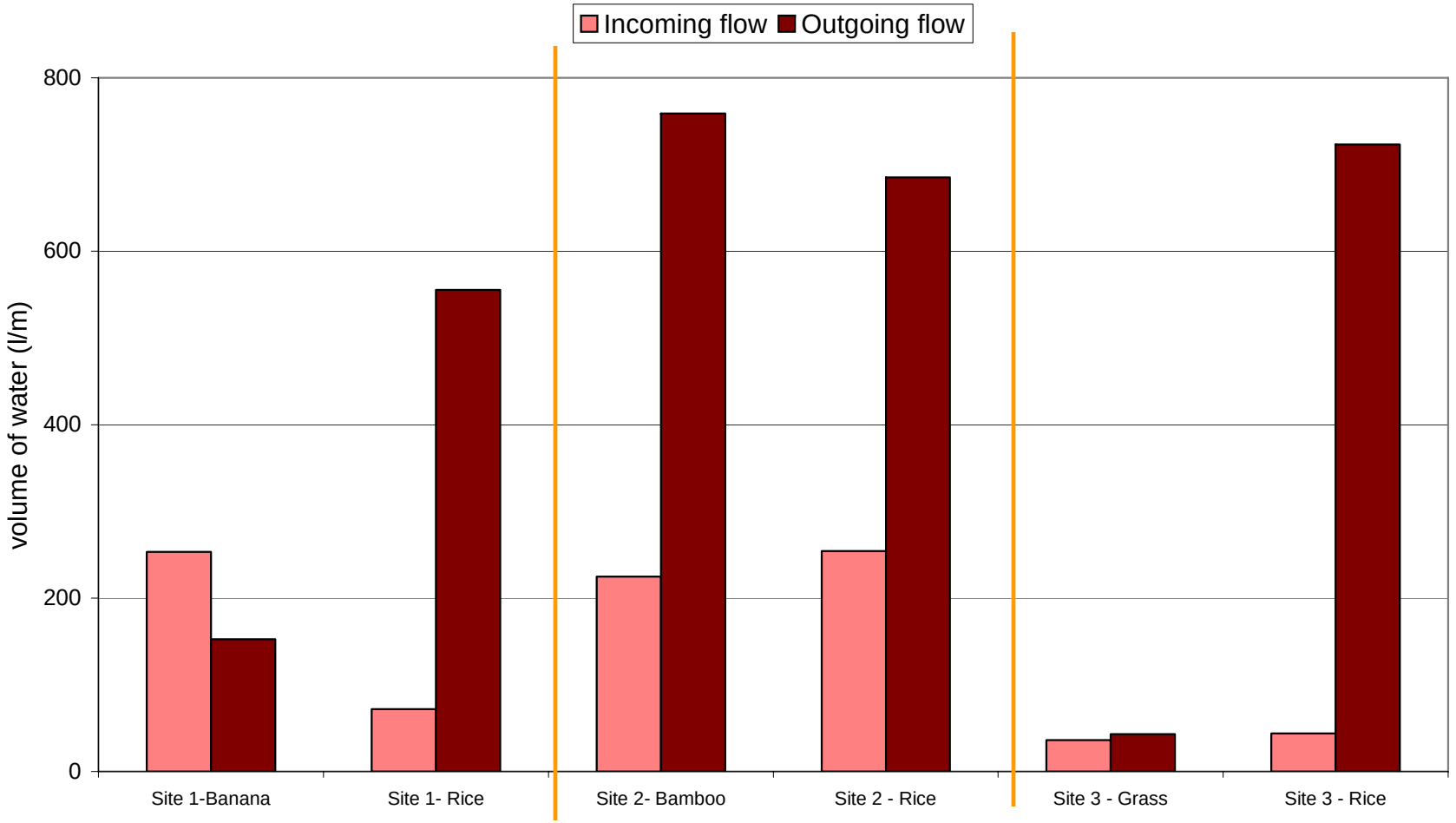
Runoff flows

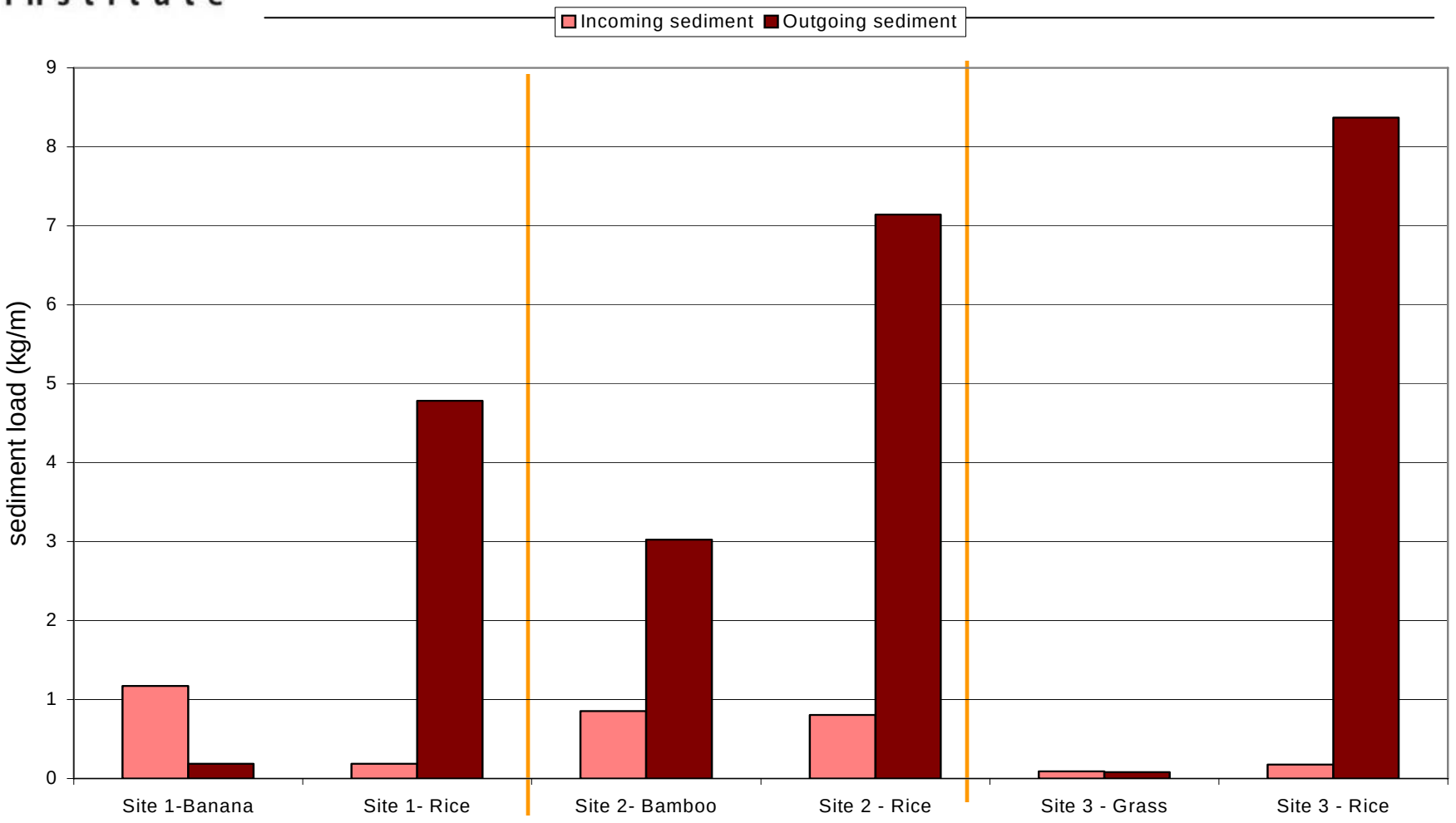


Banana

Bamboo

Natural grass

Sediment load flows



Banana

Bamboo

Natural grass

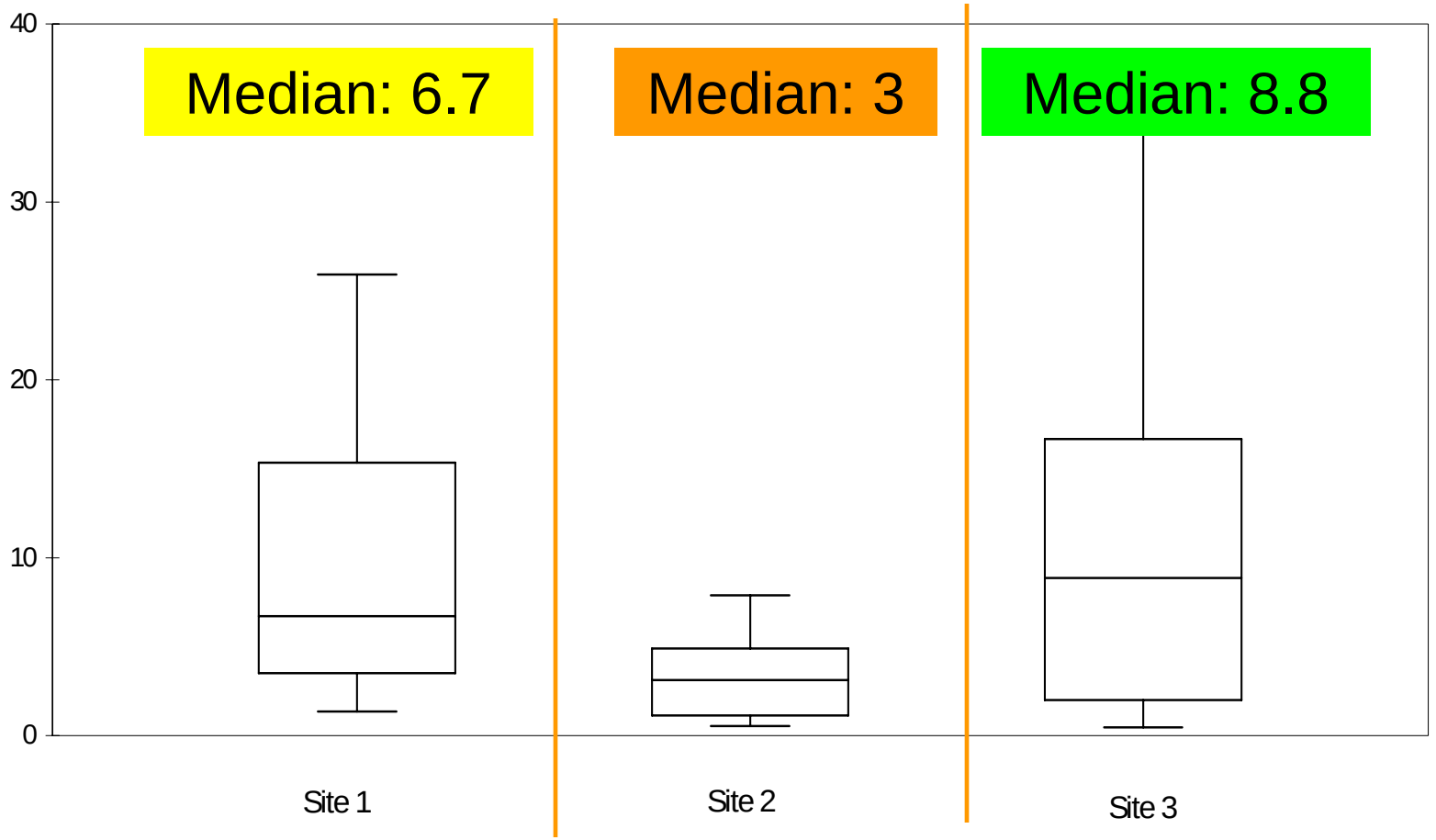
Median runoff and sediment TEs

Site		Runoff	Sediment load
1	Banana	**0.4**	**0.7**
	Rice	**-8.8**	**-25**
2	Bamboo	**-3**	**-4.5**
	Rice	**-1.7**	**-7.2**
3	Natural grass	**-0.3**	**0**
	Rice	**-22**	**-204**

Median sediment concentration TE

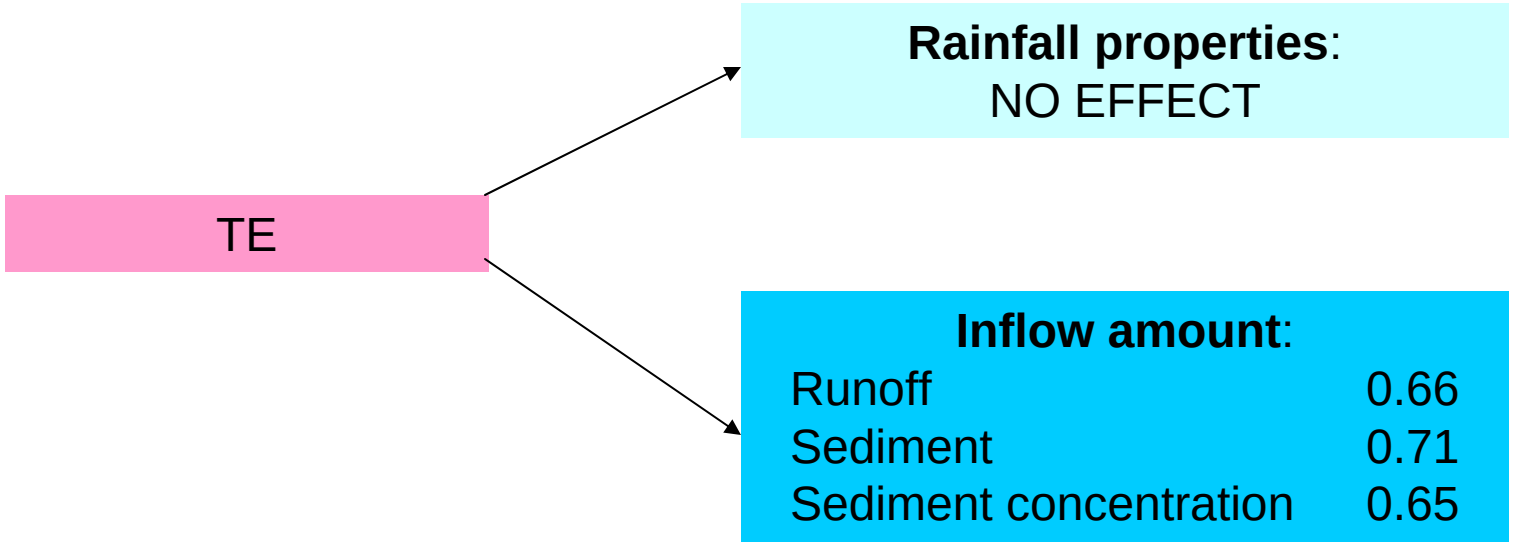
Site		Sediment concentration TE
1	Banana	**0.5**
	Rice	**-2.9**
2	Bamboo	**-0.5**
	Rice	**-0.7**
3	Natural grass	**-0.1**
	Rice	**-6.6**

Out-flow sediment concentration rice / no rice



Rice plots runoff (and sediment load) TE

Correlations of trapping efficiencies (rice plots)



Conclusions (I)

- Trapping efficiencies were generally low:
  clay material and low concentration in inflow?

- In agreement with other (few) studies in tropical countries and in open field conditions

management of riparian land should be complementary but not substitutive of sloping land management

Conclusions (II)

- Banana and natural grass were sinks of water and sediment;
- Bamboo and rice were sources of water of water and sediment;

- Cultivation of riparian land led to a 3- to 9-fold increase of sediment concentration of runoff directly delivered to the streams


cultivation of riparian land with annual crops
largely deteriorate water quality


Thank you for your attention
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